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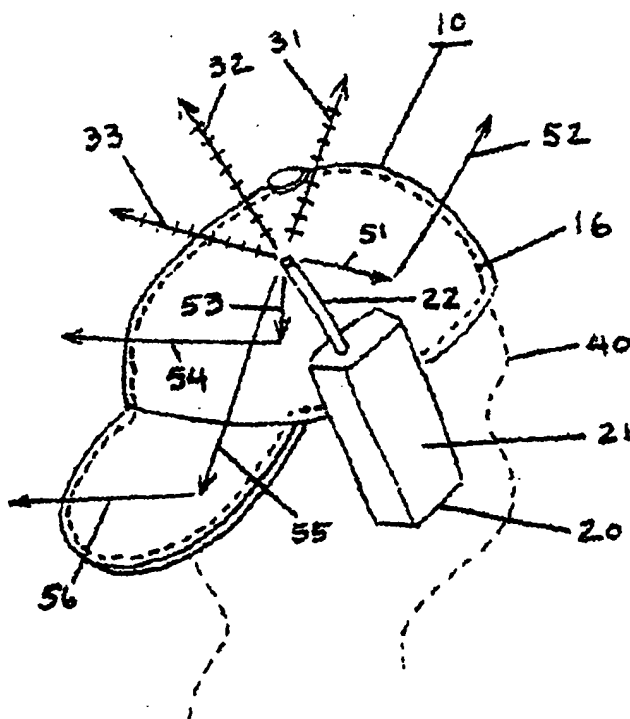
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(54) Title: DEVICE FOR RADIATION SHIELDING OF WIRELESS TRANSMIT/RECEIVE ELECTRONIC EQUIPMENT



(57) Abstract: A device for locally shielding or blocking a user from close proximity electromagnetic fields 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71 emitted by a wireless electronic equipment antenna 22 such as a cellular telephone. The device includes a wearable garments such as a baseball cap 10, electronic carrying pouch 110, fan 210, 250, 410, eyeglass 610 design, or screens, joined with having EMI/RFI material properties that is specifically worn by or placed between the user and the electromagnetic field source 22. It serves to provide as an electromagnetic field shield, either reflective, absorptive, or dissipative behavior in nature, from a direct line-of-sight electromagnetic field 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71 radiating from a wireless device antenna 22.

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Device For Radiation Shielding of Wireless Transmit / Receive Electronic Equipment

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates generally to shielding electromagnetic interference / radio frequency interference (EMI / RFI) fields and, more particularly, to shielding sensitive local human body tissue parts from potential harmful electromagnetic fields emanating from close proximity direct line-of-sight wireless transmit / receive electronic equipment antenna source.

Background Art

There is much concern throughout the world that electromagnetic field radiation and microwave radiation may cause human body tissue damage. The antenna and the body of wireless transmit / receive electronic equipment such as a cellular telephone and higher frequency band transceivers come in close contact with a person head or sensitive human body tissue part thereby creating a close exposure to electromagnetic field and microwave radiation. Because of these hazards and to offer some protection against these hazards, some form of shielding devices was invented. Current state-of-the-art provide accessories for cellular telephones or higher frequency band transceivers that will afford some protection to cellular telephone and higher

1 frequency band transceiver users from the alleged brain, head and sensitive body
2 tissue damage caused by electromagnetic field radiation of cellular telephone or higher
3 frequency band transceiver use. These accessories are primarily of closed-form design
4 solutions around the electronic equipment to reduce electromagnetic field radiation
5 emanating from the electronic equipment body, but does not attempt to sufficiently
6 reduce electromagnetic field radiation from the antenna, regarding direct line-of-sight
7 signal transmission between the antenna and the sensitive human body tissue part
8 without causing serious impact to normal signal transmission operation.

9 Some attempts to implement closed-form method shielding design solutions
10 around electromagnetic field radiation from an electronic equipment antenna would be
11 very difficult to implement without causing tremendous antenna transmit / receive
12 signal degradation for the equipment and still be effective in providing sufficiently
13 adequate shielding for the user. Strict and exacting design parameters and controls
14 over time of equipment operation on shield spacing, positioning, shield part
15 dimensions and material electrical characteristic behavior parameters under normal
16 stress movement conditions by the user, would be required to solve the complex and
17 specific antenna electromagnetic field frequency response voltage standing wave ratio
18 loading and matching criteria relative to that particular antenna electrical structure
19 design in order for proper antenna operation.

20 Note that for added clarification regarding the concept of closed-form method
21 design solutions, a simplified circuit model is shown in Figure A, that shows a
22 comparison between the closed-form versus opened-form method design solutions as
23 applied to close-proximity electromagnetic field radiation exposure to the user. Also
24 note that the basic distinction for the closed-form method design solutions is for the
25 shielding to encompass around the electronic equipment body or antenna as noted by

1 the diagrammed reference node point to antenna. But with regards to the opened-form
2 method design solution, is the shielding to encompass around the human body user
3 part as noted by the diagrammed reference node point to user. Further note, if we
4 were to start with the same finite small closed-form and opened-form surface
5 shielding area and now increase each surface area evenly further, the closed-form
6 shielding area encompasses and terminates more electromagnetic fields from the
7 antenna thereby increasing the design sensitivities and interactions, whereas for the
8 opened-form shielding area does not encompass or terminate electromagnetic fields
9 appreciably to affect the antenna operation any further for matters that would be
10 appreciated by those skilled in the art.

11 What is needed is an opened-form method design solution that is simply
12 detached from the design requirement of solving for complex antenna matching
13 criteria parameters and now centered the design solution around the exposed
14 electronic user body part, serving means to provide an electromagnetic field radiation
15 shielding or blockage, either reflective or absorptive or dissipative behavior in nature,
16 in order to reduce the direct line-of-sight antenna electromagnetic field radiation to the
17 sensitive human body tissue part without causing significant antenna signal transmit /
18 receive degradation for proper wireless electronic equipment operation and
19 simplifying the shielding device design, irrespective of any antenna strict electrical
20 and structure matching criteria that would be imposed if one were to use parameters
21 for closed-form method design solutions, thus simplifying the present invention
22 fabrication, improving performance reliability and repeatability of the present
23 invention.

24

25

SUMMARY OF THE INVENTION

1
2 In accordance with the teaching of the present invention, a shielding device
3 using opened-form method design solutions around the electronic user body part, that
4 will reduce potential harmful effects from the direct line-of-sight electromagnetic field
5 radiation of an emanating antenna source of a wireless transmit / receive electronic
6 equipment including such as and not limited to a cellular telephone is disclosed that
7 employs the use of wearable garments including and not limited to a hat, eyewear
8 articles, wearable wrap-around type articles, electronic equipment carrying pouch of
9 upwardly fan structure arrangement, foldable or fixed fan structure arrangement,
10 internally pop-up fan mechanism arrangement, screen structure arrangement, that
11 resolves the problem of inadequate antenna electromagnetic field direct line-of-sight
12 human body part shielding protection as stated in the prior art discussion.

13 The electromagnetic field radiation shielding device is comprised of a
14 wearable garments including a hat, eyewear articles, wearable wrap-around type
15 articles, electronic equipment carrying pouch of upwardly fan structure arrangement,
16 foldable or fixed fan structure arrangement, internally pop-up fan mechanism
17 arrangement, screen structure arrangement, that employs the use of EMI / RFI material
18 properties which will provide shielding or blockage (either reflective or absorptive or
19 dissipative behavior in nature or some interdependency combinations of said behavior
20 group) of harmful direct line-of-sight electromagnetic field radiation from an
21 emanating antenna wireless transmit / receive electronic equipment source. This
22 device is placed in relatively close-proximity with or without contact to the sensitive
23 human body tissue part and lies in the direct line-of-sight to the emanating antenna
24 electromagnetic field radiation or propagation field path of travel. Additional objects,
25 advantages, and features of the present invention will become apparent from the

1 following description and appended claims, taken in conjunction with the
2 accompanying drawings.

3

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5

BRIEF DESCRIPTION OF THE DRAWINGS

6

Figure A is a simplified circuit model comparison between a closed-form
7 versus opened-form method design solutions as applied to close-proximity
8 electromagnetic field radiation exposure to the user;

9

Figure 1 is a perspective view of such wearable garment device such as a
10 baseball cap with having EMI / RFI material properties, providing local area shielding
11 or blockage from close-proximity wireless transmit / receive electronic equipment
12 according to an embodiment of the present invention;

13

Figure 2 is a perspective view of such wearable garment device in Figure 1
14 depicting a modified implementation of the embodiment as worn differently by the
15 user to provide a variation in shielding coverage area;

16

Figure 3 is a perspective view of such electronic equipment carrying pouch of
17 extended upwardly fan structure arrangement device with having EMI / RFI material
18 properties providing various applications to shielding sensitive human body tissue
19 part, according to an embodiment of the present invention;

20

Figure 4 is a perspective view of such foldable or fixed fan device structure
21 arrangement with having EMI / RFI material properties providing various applications
22 to shielding sensitive human body tissue part, according to an embodiment of the
23 present invention;

24

Figure 5 is a perspective view of such internally pop-up foldable fan device
25 structure arrangement with having EMI / RFI material properties providing various

1 applications to shielding sensitive human body tissue part, according to an
2 embodiment of the present invention;

3 Figure 6 is a perspective view of such sandwiched type screen device
4 arrangement with having EMI / RFI material properties providing various applications
5 to shielding a sensitive human body tissue part, according to an embodiment of the
6 present invention;

7 Figure 7 is a perspective view in variation of such sandwiched type screen
8 device similar to Figure 6 as located differently with the wireless transmit / receive
9 electronic equipment by the user to provide a variation in shielding area according to
10 an embodiment of the present invention;

11 Figure 8 is a perspective view of such screen or blind-screen device with
12 having EMI / RFI material properties providing various applications to shielding
13 sensitive human body tissue part, according to an embodiment of the present
14 invention;

15 Figure 9 is a perspective view of such eye-glass device with having EMI / RFI
16 material properties providing various applications to shielding sensitive human body
17 tissue part, according to an embodiment of the present invention;

18 Figure 10 is a perspective view of the " Cell-Shield Wearable " logo according
19 to an embodiment of the present invention.

20

21

22 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

23 By way of opened-form method design solutions, the following discussion of
24 the preferred embodiments directed to wearable garments including and not limited to
25 a hat as a baseball cap, eyewear articles including and not limited to an eye-glass,

1 electronic equipment carrying pouch of extended upwardly fan structure arrangement,
2 foldable or fixed fan structure arrangement, internally pop-up fan mechanism
3 arrangement, screen articles, wearable wrap-around type articles, where said items
4 joined with having EMI / RFI material properties that is predeterminedly worn by the
5 user or placed between the user and the electromagnetic field emanating wireless
6 transmit / receive electronic equipment 20 as comprised of an electronic body 21 and
7 antenna 22, serves to provide predetermined local human body tissue part area with
8 electromagnetic field shielding or blockage , either reflective or absorptive or
9 dissipative behavior in nature or some interdependency combinations of said behavior
10 group, from exposure to direct line-of-sight electromagnetic field signal radiating
11 from a wireless transmit / receive electronic equipment antenna 22 is merely
12 exemplary in nature and is in no way intended to limit the invention or its applications
13 or uses. It is further noted that in all following antenna 22 discussions, although the
14 drawings shown are in external electronic body antenna structure design form
15 representation, an internally embedded electronic body antenna structure design form
16 in meaning is encompassed in this embodiment.

17 Referring to Figures 1 through 9 are perspective views of such wearable
18 garment device types, electronic equipment carrying pouch of upwardly fan structure
19 arrangement, fan structure arrangement, eyewear articles and screen article types,
20 joined with having EMI / RFI material properties for which the invention is located
21 between the sensitive human body tissue part area and the direct line-of-sight
22 electromagnetic field radiation emanating from a wireless transmit / receive electronic
23 equipment antenna 22. Electromagnetic field radiation emanating from a wireless
24 transmits / receive electronic equipment antenna 22 when located in close-proximity
25 to a user human body tissue part will propagate a portion of its energy through the

1 human body tissue non-blocked. The nature of this invention provides the affected
2 local human body tissue part area with predetermined electromagnetic field shielding
3 or blockage effective area zone of protection from exposure to direct line-of-sight
4 electromagnetic fields. These electromagnetic fields propagates in a path of travel
5 that originates from an antenna 22 which emanates a composite of electromagnetic
6 fields traveling in a radial isotropic direction and those of the direct line-of-sight
7 electromagnetic fields towards the sensitive human body tissue part. A
8 predetermined portion of the electromagnetic fields are then blocked by the invention
9 shielding effective area zone and thereby leaving the outside region of the shielding
10 effective area zone comprising the remaining non-blocked electromagnetic field
11 radiation to be un-perturbed for normal equipment signal transmission operation.

12 In close-proximity electromagnetic field radiation exposure to the user, the
13 invention variation of Figure 1 is a perspective view of such wearable garment device
14 type joined with having EMI / RFI material properties that is worn on the user head
15 40, in particular but not limited to any hat design, a baseball cap 10 design to provide
16 local head shielding or blockage effective area 15 from exposure to direct line-of-sight
17 electromagnetic field radiation 51, 53 emanating from a wireless transmit /receive
18 electronic equipment antenna 22. In addition, in Figure 2 the user may wear the
19 baseball cap 10 design in a different orientation over the head that will provide
20 various shielding coverage, local head blockage effective area 16 from exposure to
21 direct line-of-sight electromagnetic field radiation 55 to the head with respect to the
22 wireless transmit / receive electronic equipment antenna 22 position.

23 As shown in Figures 1 and 2 according to the invention, potential harmful
24 direct line-of-sight electromagnetic field radiation 51, 53, 55 are shielded or blocked
25 as reflective or absorptive or dissipative behavior in nature or some interdependency

1 combination of said behavior group, from propagating through the invention and
2 through the sensitive human body tissue part area directly behind or beneath the
3 invention.

4 Note in general description applied to Figures 1 to 9, the diagrammed legend
5 39 describes a pictorial representation of the electromagnetic field radiation travel
6 pattern as representative sample-point lines of directional travel path and are depicted
7 as interconnecting lines with arrows for examples of deflected or blocked
8 electromagnetic field radiation travel patterns 51 to 52, 53 to 54, 55 to 56, 57 to 58, 59
9 to 60, 61 to 62, 63 to 64, 65 to 66, 67 to 68 as influenced by the functional behavior of
10 the invention local shielding effective area and the other lines with tick marks and
11 arrows are shown for examples of non-blocked electromagnetic field radiation travel
12 patterns 30, 31, 32, 33, 34, 35, 36, 37, 38 as is not designed to be shielded or blocked
13 by the invention. With respect to Figures 1 and 2, examples of shielded or blocked
14 electromagnetic fields 51 to 52, 53 to 54, 55 to 56 and non-blocked electromagnetic
15 fields 30, 31, 32, 33 are shown to demonstrate the inventions shielding or blocking
16 functional nature. Also note, in general, a typical wearable garment radiation shield
17 material cross-sectional view 11 of the invention is shown, and is not limited in basic
18 design form implementation to be employed with other wearable garments including
19 and not limited to hats, electronic equipment carrying pouch of extended upwardly fan
20 structure arrangement, foldable or fixed fan structure arrangement, internally pop-up
21 fan mechanism arrangement, eyewear articles as an eye-glass, screens, blind-screen,
22 wearable wrap-around type articles, is a baseball cap 10 device material cross-
23 sectional perspective, joined with EMI / RFI material properties.

24 The general device material cross-sectional view 11 perspective of the
25 invention joined with having EMI / RFI material properties layered together in a

1 predetermined about or multitude of alternating sandwiched material layer fashion
2 such as and not limited to: an outside EMI / RFI material layer 12 option, an optional
3 cloth or other support material layer 13 and an inside EMI / RFI material layer 14
4 option.

5 Also note in Figures 1 and 2 that the head shielding effective area 15, 16
6 perspective is designed to encompass around the user head 40 and not around the
7 antenna 22, thus the invention design constituting an opened-form method design
8 solutions.

9 In another example of close-proximity electromagnetic field radiation
10 exposure to the user, the invention variation of Figure 3 is a back, side and front
11 perspective view of such electronic equipment carrying pouch of extended upwardly
12 fan structure arrangement device 110 joined with having EMI / RFI material
13 properties, with electronic equipment access window holes 124, 125, 126 as required,
14 that is hand-held by the user, near the head 41, 42, perspective. The wireless
15 transmit / receive electronic equipment 20, in particular but not limited to a cellular
16 telephone, a cellular telephone predeterminedly placed inside the electronic equipment
17 carrying pouch of extended upwardly fan structure arrangement 110 to provide
18 electromagnetic field local head shielding or blockage effective area 120 from
19 exposure to direct line-of-sight electromagnetic field radiation 57 to 58, 59 to 60
20 emanating from a wireless transmit / receive electronic equipment antenna 22
21 position. The remaining non-blocked electromagnetic field radiation 34, 36 are left
22 un-perturbed by the invention design. Further note that the head shielding effective
23 area 120 is designed to relatively encompass around the head 41, 42 perspective and
24 not around the antenna 22, thus the invention design constituting an opened-form
25 method design solutions.

1 Likewise, in another example of a close-proximity electromagnetic field
2 radiation exposure to the user, the invention variation of Figure 4 is a back, front and
3 side perspective view of such foldable or fixed fan device structure arrangement 210,
4 joined with having EMI / RFI material properties and said fan device structure
5 arrangement 210 that implements a clipped-on or slip-fitted on attachment
6 arrangement 220. The wireless transmit / receive electronic equipment 20,
7 predeterminedly attached to the clipped-on or slip-fitted on attachment arrangement
8 220 will provide electromagnetic field local head blockage effective area 121 from
9 exposure to direct line-of-sight electromagnetic field radiation 57 t 58, 59 to 60
10 emanating from a wireless transmit / receive electronic equipment antenna 22
11 position. The non-blocked electromagnetic field radiation 34, 35 are left un-perturbed
12 by invention design. Or as shown in another variation of the invention, in Figure 5 an
13 internally pop-up fan mechanism arrangement 250 within the user wireless transmit /
14 receive electronic equipment antenna body 23, comprising a slide position mechanism
15 24 within a slide assembly 26 and thereby mechanically supports the fan device pop-
16 up mechanism structure arrangement 250 joined with EMI / RFI material properties.
17 Again further note that the local head blockage effective area 121 and 127
18 respectively, is designed to relatively encompass around the user head and not around
19 the antenna 22, thus the invention design constituting an opened-form method design
20 solutions.

21 Continuing another example of a close-proximity electromagnetic field
22 radiation exposure to the user, the invention variation of Figure 6 is a front and side
23 perspective view of such sandwiched type screen device arrangement 310 joined with
24 EMI / RFI material properties, or modified slotted sandwiched type screen device
25 arrangement 311 joined with EMI / RFI material properties, that is either slipped-in

1 arrangement between the wireless transmit / receive electronic equipment 20, a belt
2 arrangement 29 and the user body part 43,45 perspective for device arrangement
3 310, or is slip-fitted onto the wireless transmit / receive electronic equipment body
4 hanger 23 which is then sandwiched closely against the user body 44 and hung in
5 support by a belt arrangement 29 for device arrangement 311. Electromagnetic field
6 user body part shielding or blockage effective area 122 is provided by either approach
7 through sandwiched type screen device arrangement 310 or 311 from exposure to
8 direct line-of-sight electromagnetic field radiation 57 to 58, 59 to 60 emanating from a
9 wireless transmit receive electronic equipment antenna 22 position. The non-blocked
10 electromagnetic field radiation 34, 35, 36 perspective, are left un-perturbed by the
11 invention design. Note that the user body part shielding effective area 122 is designed
12 to relatively encompass around the user body part 43, 44, 45 perspective and not
13 around the antenna 22, thus the invention design constituting an opened-form method
14 design solutions.

15 In contrast, note that preceding invention variations discussions were examples
16 of close-proximity electromagnetic field radiation exposure to the user. But for Figure
17 7, this invention variation applies to relative far-field proximity electromagnetic field
18 radiation exposure to the user in providing effective shielding. This invention
19 variation of Figure 7 is a front and side perspective view of such variation of
20 sandwiched type screen device 410 joined with EMI / RFI material properties that is
21 slipped-in arrangement between the wireless transmit / receive electronic equipment
22 antenna 22 and computer device 90 in direct line-of-sight of the human body head
23 sensitive tissue part 46, 47, perspective. The sandwiched type screen device 410 is
24 predeterminedly placed between the wireless transmit / receive electronic equipment
25 20, in particular but not limited to a cellular telephone, the back or front side view of

1 the computer device 90, as to provide electromagnetic field local head shielding or
2 blockage effective area 123 from exposure to direct line-of-sight electromagnetic field
3 radiation 57 to 58, 59 to 60, emanating from a wireless transmit / receive electronic
4 equipment antenna 22 position. The non-blocked electromagnetic field radiation 34,
5 35 are left un-perturbed by the invention design. Note that the local head shielding
6 effective area 123 is designed to relatively encompass around the user head 46, 47
7 perspective and not around the antenna 22, thus the invention design constituting an
8 opened-form method design solutions.

9 For another invention variation in far-field proximity electromagnetic field
10 radiation exposure to the user as shown in Figure 8 is a perspective view of such
11 screen or blind-screen device joined with EMI / RFI material properties of
12 predetermined size that is either free-standing screen 510 or suspended screen 550
13 from a support structure and is predeterminedly placed between the wireless transmit /
14 receive electronic equipment antenna 22 and the user human body 48, 49,
15 perspective. Shielding is provided by the electromagnetic field shielding effective
16 area 524, 525 perspective, for the human body from exposure to direct line-of-sight
17 electromagnetic field radiation 61 to 62, 63 to 64 and 65 to 66, 67 to 68 perspective
18 emanating from a wireless transmit /receive electronic equipment antenna 22 position.
19 The non-blocked electromagnetic field radiation 34, 35 are left un-perturbed by the
20 invention design. Note that the user body shielding effective area 524, 525
21 perspective is designed to relatively encompass around the user body 48, 49
22 perspective and not around the antenna 22, thus the invention design constituting an
23 opened-form method design solutions.

24 In another example of far-field proximity electromagnetic field radiation
25 exposure to the user, the invention variation of Figure 9 is a front and back

1 perspective view of such eye-glass device 610 joined with having EMI / RFI material
2 properties that is permanently or non-permanently attached that will provide local eye
3 shielding or blockage effective area 627 from exposure to direct line-of-sight
4 electromagnetic field radiation 69 to 70, 71 to 72 emanating from a wireless transmit /
5 receive electronic equipment antenna 22. The non-blocked electromagnetic field
6 radiation 37, 38 are left un-perturbed by the invention design. The wireless transmit /
7 receive electronic equipment in this case and not limited to function, may represent
8 visual information content, such that the user human body head 49, 149 shown
9 perspectively may expose sensitive human body tissue eye part to potential harmful
10 direct line-of-sight electromagnetic fields. Note that the local eye shielding effective
11 area 627 is designed to relatively encompass around the human body head 49, 149
12 perspectively and not around the antenna 22, thus the invention design constituting an
13 opened-form method design solutions.

14 Figure 10 is a perspective view of the "Cell-Shield Wearables" logo 700
15 encompassing an overall 1 to 1 aspect ratio design area and simple general logo design
16 dimensions according to the embodiment of the present invention.

17 The discussion above describes wearable garments, electronic equipment
18 carrying pouch, fan structures, eyewear articles and screen articles, joined with EMI /
19 RFI material properties that include several variations to allow it operated as an
20 electromagnetic field radiation shielding or blockage device for the predetermined
21 human body tissue part, either predeterminedly worn or placed in close proximity to
22 the user. Although various implementations and variations are discussed above, other
23 variations can be incorporated within the scope of the present invention, as would be
24 appreciated by those skilled in the art. The foregoing discussion discloses and
25 describes merely exemplary embodiments of the present invention. One skilled in the

1 art will readily recognize from such discussion, and from the accompanying drawings
2 and claims, that various changes, modifications and variations can be made therein
3 without departing from the spirit and scope of the invention as defined in the
4 following claims.

5

6

7 Claims:

8 1. A method of shielding electromagnetic fields 51, 53, 55, 57, 59, 61, 63, 65, 67,
9 69, 71 from direct line-of-sight antenna signal radiation of an wireless transmit /
10 receive electronic equipment antenna 22 such as and not limited to a cellular
11 telephone antenna, comprises the use of:

12 Joining wearable garments including and not limited to types of hats, such as a
13 baseball cap 10 with electromagnetic interference / radio frequency
14 interference (EMI / RFI) material properties to form hybrid wearable garment
15 devices, Joining various design types of screens 310, 510, 550 with EMI / RFI
16 material properties to form types of hybrid screen devices,

17 Joining eyewear articles including and not limited to an eyeglass 610 with EMI
18 /RFI material properties to form types of hybrid eyewear article devices,

19 Joining wearable wrap-around type articles including and not limited to a
20 bandanna or to a scarf with EMI / RFI material properties to form hybrid
21 wearable wrap-around type article devices,

22 Joining electronic equipment carrying pouch 110 of extended upwardly fan
23 structure arrangement with EMI / RFI material properties to form hybrid
24 electronic equipment carrying pouch of extended upwardly fan structure
25 arrangement devices,

- 1 Joining foldable or fixed fan structure arrangement 210, 410 with EMI / RFI
2 material properties to form hybrid foldable or fixed fan structure arrangement
3 devices,
4 Joining an internally pop-up fan mechanism arrangement 250 with EMI / RFI
5 material properties to form hybrid internally pop-up fan arrangement devices,
6 Whereby said devices are specifically worn or placed between the wireless
7 transmit / receive electronic equipment antenna 22 and the sensitive human
8 body tissue part to provide means for effective electromagnetic field shielding
9 or blockage, either reflective or absorptive or dissipative behavior in nature or
10 some interdependency combinations of said behavior group, from potentially
11 harmful direct line-of-sight of electromagnetic fields 51, 53, 55, 57, 59, 61, 63,
12 65, 67, 69, 71 emanating from a wireless transmit / receive electronic
13 equipment antenna 22, as solutions for opened-form design method which
14 serves to minimize the shielding degradation effects and sensitivity interaction
15 effects on normal non-blocked electromagnetic fields 30, 31, 32, 33, 34, 35,
16 36, 37, 38 antenna signal transmission operation.
17
18 2. A method of shielding electromagnetic fields 51, 53, 55, 57, 59, 61, 63, 65, 67,
19 69, 71 emanating from wearable electronic hardware equipment with wireless
20 transmit / receive electronic equipment capability, according to claim 1,
21 Whereby said devices are specifically worn between the wearable electronic
22 hardware equipment wireless antenna 22 area and the sensitive human body
23 tissue part area to provide means for predetermined local human body tissue
24 area shielding of electromagnetic fields emanating from various types of
25 wearable electronic equipments.

- 1 3. An electromagnetic field shielding or blockage device according to claim 1
2 comprises of:
3 a plurality of EMI / RFI materials, processes and forms used to operate
4 specifically within the 100 Mega-Hertz to 300 Giga-Hertz electromagnetic
5 field frequency spectrum range parameter,
6 a plurality of EMI / RFI materials and processes used comprising and not
7 limited to: conductive composites, conductive laminates, conductive fibers,
8 molded / extruded conductive elastomers, conductive silicone-base,
9 conductive polymer-base, woven fabric, foam, conductive coatings, foil, tape,
10 film shielding laminates, conductive film can be Indium Tin Oxide (ITO) or
11 multi-layer conductive coatings, conductive material deposition process, silk
12 screen on conductive paint, metal mesh, knitted wire mesh, grilles, which
13 constitute electrical properties having a predetermined resistivity range and is
14 within about zero ohms per square and less than or equal to 100,000 ohms per
15 square range parameter,
16 a plurality of EMI / RFI materials used comprising of types of forms such as
17 and not limited to: conductive woven fabric, metal or polymer-based or
18 silicone-based mesh, knitted wire mesh, grilles, of said types of forms having a
19 multitude array of square holes in sheet-material form of predetermined
20 thickness, where said forms design comprises a grid structure arrangement of
21 square holes, the overall effective square hole area design range is within
22 about zero to 0.01 inch² in grid area effective square hole dimensions, which
23 constitute electrical properties having predetermined electromagnetic
24 waveguide cutoff wavelength range parameter behavior in nature,

1 a plurality of EMI / RFI materials used comprising of types of material
2 textures such as and not limited to: flat surface shape, periodic triangular-
3 surface or accordion surface shape, periodic grid of pyramidal volume
4 protruding element surface shape, periodic grid of semi-bubble volume
5 protruding-in or protruding-out element surface shape, periodic grid of waffle-
6 iron shape protruding-out or protruding-in element surface shape, which
7 constitute the enhancement of increasing electromagnetic field surface
8 absorption range parameter behavior in nature,
9 whereby said electrical design range parameters contain means for effective
10 electromagnetic field shielding or blockage by the invention and serves to
11 minimize the shielding degradation effects and sensitivity interaction effects
12 on non-blocked electromagnetic field 30, 31, 32, 33, 34, 35, 36, 37, 38 normal
13 antenna signal transmission operation.

14

15 4. An electromagnetic field shielding or blockage device according to claim 1,
16 where said electromagnetic shielding device comprising:
17 a plurality of conventional fabrication techniques used to produce wearable
18 garments including a hat such as and not limited to a baseball cap 10,
19 a plurality of conventional fabrication techniques used to produce wearable
20 wrap-around type articles including and not limited to a bandanna or scarf,
21 a plurality of conventional fabrication techniques used to produce a electronic
22 equipment carrying pouch 110 of extended upwardly fan structure
23 arrangement,
24 a plurality of conventional fabrication techniques used to produce eyewear
25 articles including and not limited to an eye-glass 610,

1 a plurality of conventional fabrication techniques used to produce attachable
2 fan structure arrangement 210, 410 with fixed or foldable or collapsible
3 functions,

4 a plurality of conventional fabrication techniques used to produce internal
5 electronic equipment pop-up fan mechanism arrangement 250 with fixed or
6 foldable or collapsible functions,

7 a plurality of conventional fabrication techniques used to produce free-
8 standing 510 or suspended support screen 550 structures including and not
9 limited to blinds with fixed or foldable or collapsible functions,
10 where said conventional fabrication techniques joined specifically with EMI /
11 RFI material properties to form hybrid fabrication constructions and process
12 forms of the electromagnetic field shielding device, comprises of and not
13 limited to:

14 an EMI / RFI material layer or liner joined in a predetermined about or
15 multitude of alternating sandwich layered fashion 11 with a
16 predetermined wearable garment layer or support member structure
17 layer or screen structure layer where said sandwich layers could be
18 sewn on together, or adhesively attached or a wrapped around
19 configuration or a temporary attachment by way of clip-on pins or
20 pinned on attach or Velcro-attached or non-permanent bond adhesive
21 attach or process depositioned attach together, to form together a
22 predetermined sandwiched layer arrangement,
23 or an EMI / RFI material layer joined with predetermined about or
24 multitude layers of a predetermined wearable garment layer or support
25 member layer or screen structure layer to form together a

1 predetermined laminate arrangement, or a some about or multitude
2 combination of predetermined EMI / RFI material types and layers
3 used entirely in place of the wearable garment layer or the support
4 member structure layer or the screen structure layer To form together a
5 predetermined hybrid material and process arrangement,
6 whereby said conventional fabrication techniques, said predetermined
7 sandwiched layer arrangement 11, said predetermined laminate
8 arrangement, said predetermined hybrid material and process
9 arrangement, provide predetermined methods of hybrid wearable
10 garment fabrication construction techniques, hybrid eyewear article
11 fabrication construction techniques, hybrid fan structure fabrication
12 construction techniques, hybrid pop-up fan mechanism fabrication
13 construction techniques, and hybrid screen structure fabrication
14 construction techniques for the invention.

15

16 5. A method of device rating the shielding or blockage effectiveness of reducing
17 the energy of radiated electromagnetic fields 51, 53, 55, 57, 59, 61, 63, 65, 67,
18 69, 71 is referred to as radiation blockage factor (RBF) comprising of:
19 the standard unit of RBF measurement is the decibel or dB,
20 the decibel value is the ratio of two measurements of electromagnetic field
21 ratio of two measurement of electromagnetic field strength taken before and
22 after shielding is in place, the method by which RBF may be estimated is the
23 transmission line method and circuit method (IEEE, 1988, "Special issue on
24 electromagnetic shielding", IEEE Transactions on EMC, EMC-30, No. 3,
25 August), an alternate standard unit of RBF measurement is in magnitude ratio

1 defined as $M_{RBF} = 10^{(RBF/20)}$, alternate nomenclatures for RBF device
2 rating the shielding effectiveness, are radiation proof factor (RPF) and
3 radiation shield factor (RSF), an alternate standard unit of RPF measurement
4 is in magnitude ratio defined as $M_{RPF} = 10^{(RPF/20)}$, and an alternate standard
5 unit of RSF measurement is in magnitude ratio defined as $M_{RSF} =$
6 $10^{(RSF/20)}$, whereby said device rating provide a quality figure-of-merit
7 measure for the invention.

8

9 6. A method of product awareness for the hybrid wearable garments 10, hybrid
10 wearable wrap-around type articles, hybrid screens 310, 510, 550, hybrid fan
11 structure arrangements 210, 250, 410, hybrid carrying pouch arrangements
12 110, and hybrid eyewear articles 610 as a means for their electromagnetic field
13 shielding property from direct line-of-sight antenna 22 signal transmission of a
14 wireless transmit / receive electronic equipment 20, is comprised of:
15 the trademark name, " Cell-Shield Wearables ", the combination of colors,
16 orange and yellow , used in print for the " Cell-Shield Wearables " name and
17 logo, the logo for the " Cell-Shield Wearables " trademark name as shown in
18 Figure 10, whereby said product awareness items provide a quality name brand
19 recognition for reliability and dependability from the invention.

20

21 7. A method of shielding electromagnetic fields 51, 53, 55, 57, 59, 61, 63, 65, 67,
22 69, 71 according to claim 1 embodies both externally mounted electronic body
23 antenna 22 and internally embedded electronic body antenna structure design
24 types.

25

1 8. A method of predetermined effective shielding area coverage protection
2 according to claim 1 comprising:
3 an increasing or decreasing elongated invention structure to encompass around
4 the user body part in a predetermined set of dimensions of length, width,
5 height or thickness of the embodiments of the shield device invention
6 variations, whereby said predetermined effective shielding area coverage
7 provide means of predetermined compliance in meeting the user's required
8 electromagnetic field shielding or blocking performance.

9
10 9. Another method of alternate device rating the shielding or blockage
11 effectiveness of reducing the energy of a radiated electromagnetic field 51, 53,
12 55, 57, 59, 61, 63, 65, 67, 69, 71 according to claim 5 as other alternate
13 nomenclatures to mean equivalently RBF nomenclature in nature, includes:
14 electromagnetic-field blockage factor (EBF), electromagnetic-field proof
15 factor (EPF), electromagnetic-field shield factor (ESF), cell-phone blockage
16 factor (CBF), cell-phone proof factor (CPF), cell-phone shield factor (CSF),
17 whereby said alternate device ratings provide a terminology extension of
18 shield effectiveness rating nomenclature means to provide a relevant quality
19 figure-of-merit measure for the invention.

20

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22

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24

25

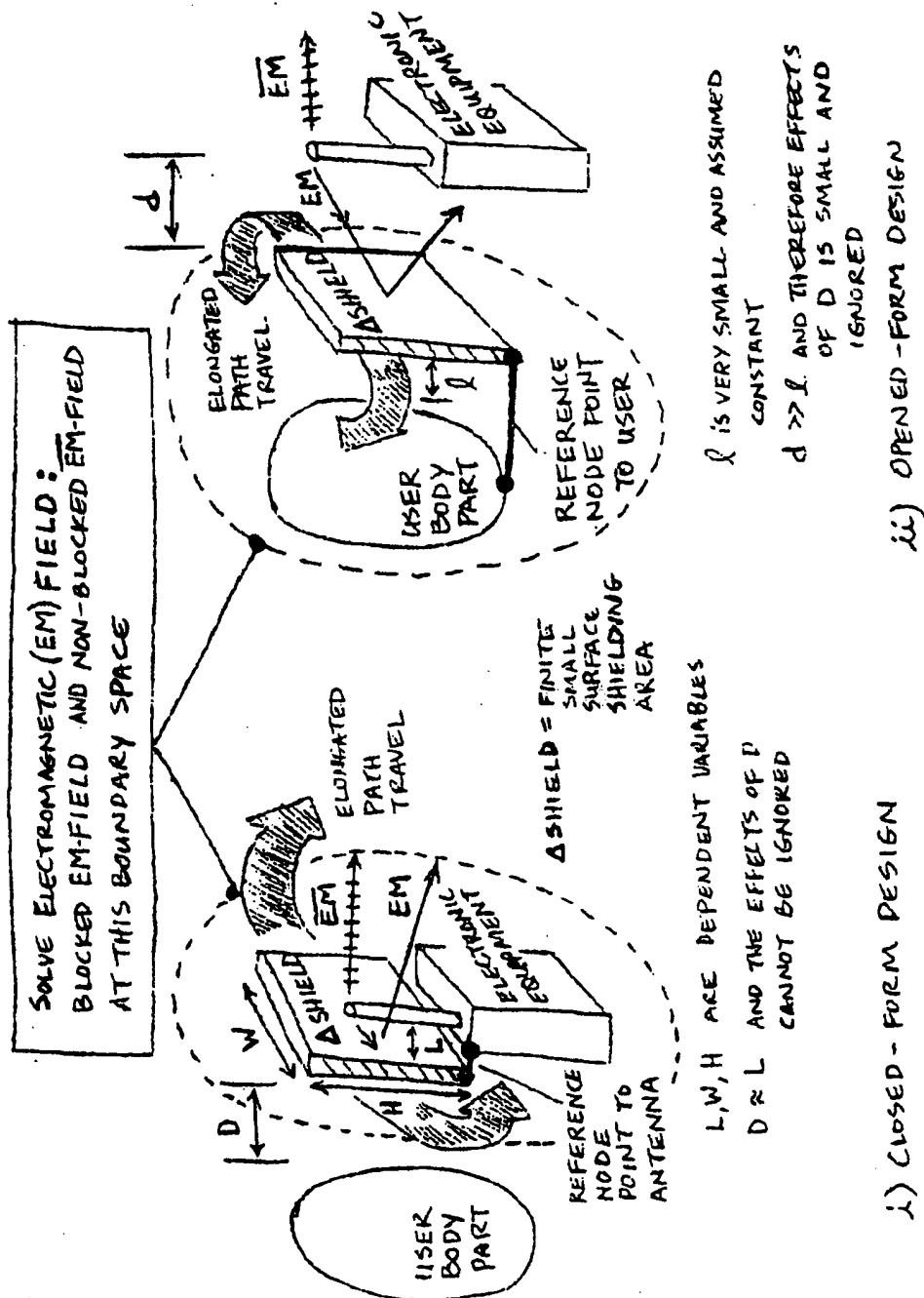


FIGURE A. SIMPLIFIED CIRCUIT MODEL COMPARISON BETWEEN CLOSED-FORM DESIGN VERSUS OPENED-FORM DESIGN METHOD DESIGN SOLUTIONS.

FIGURE 1

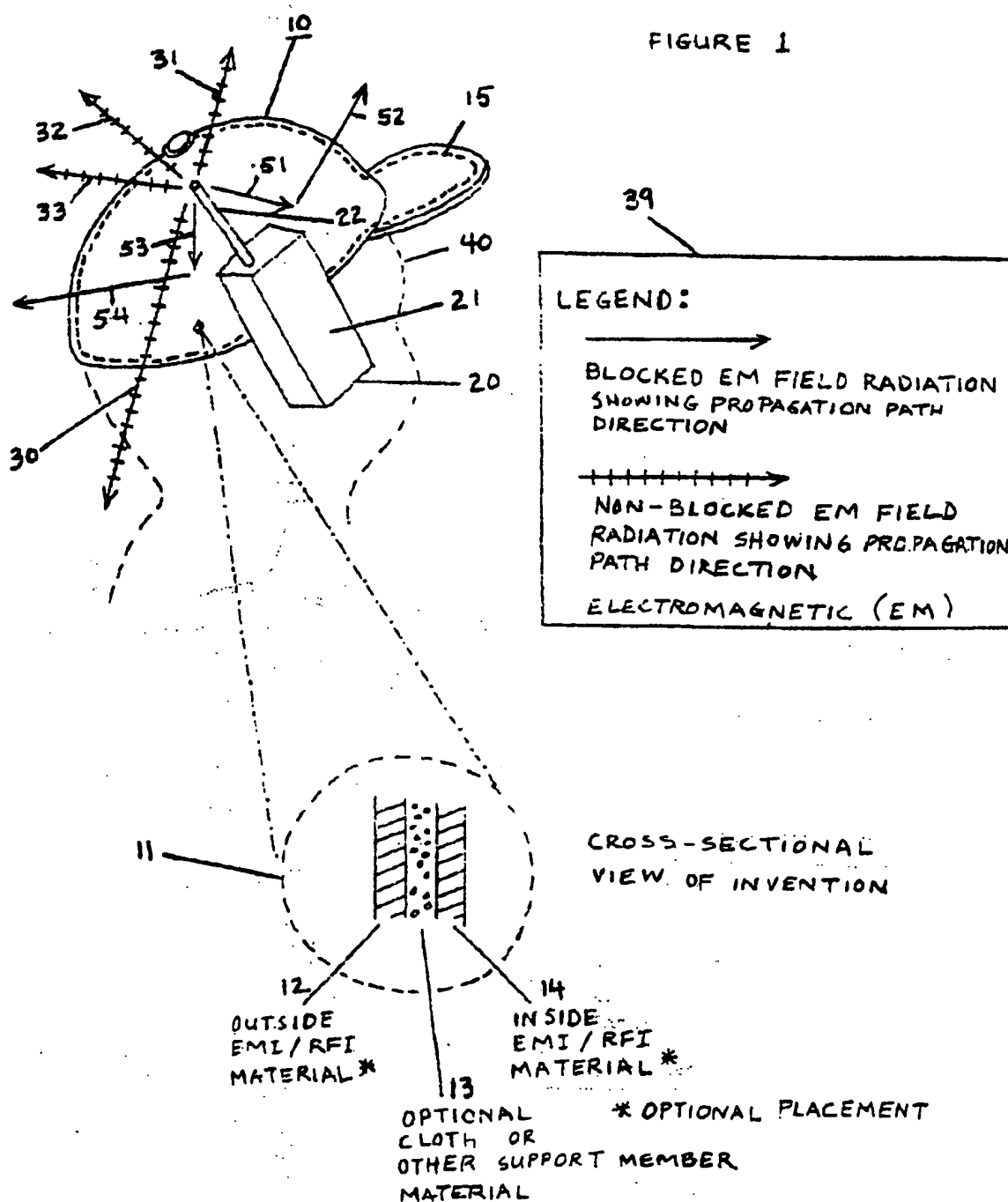
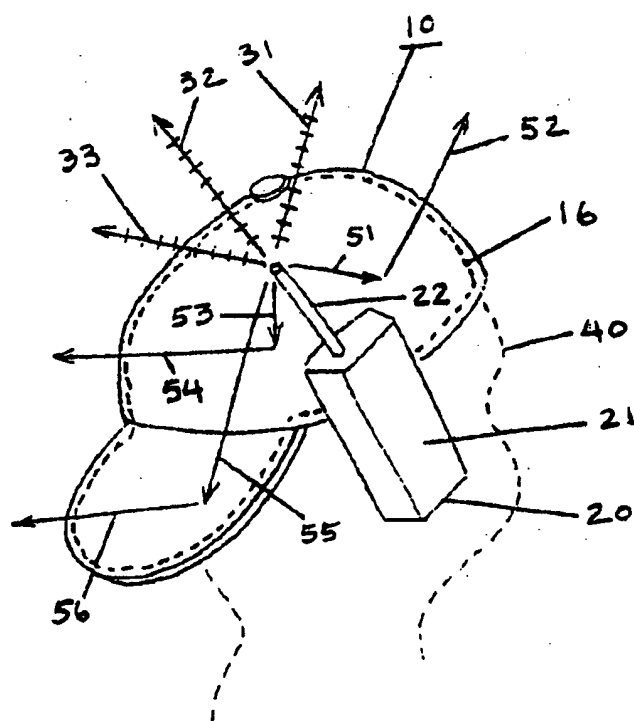


FIGURE 2



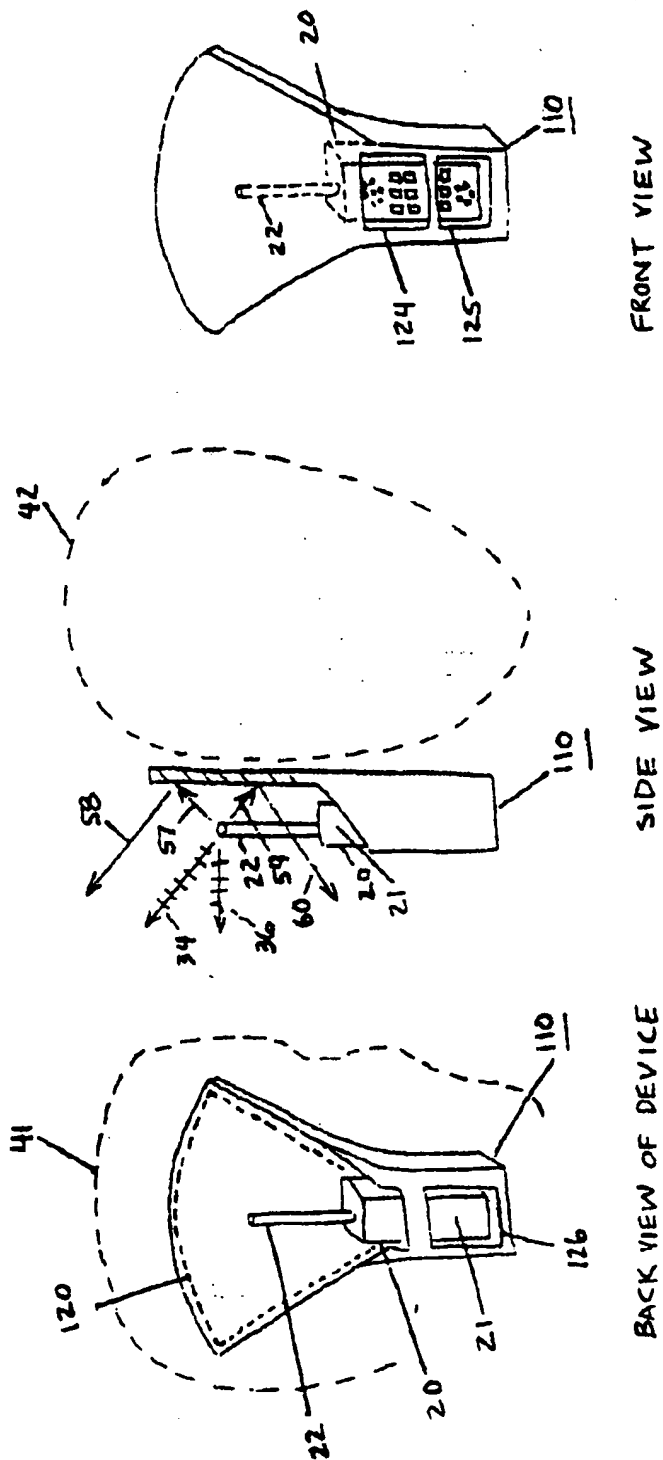
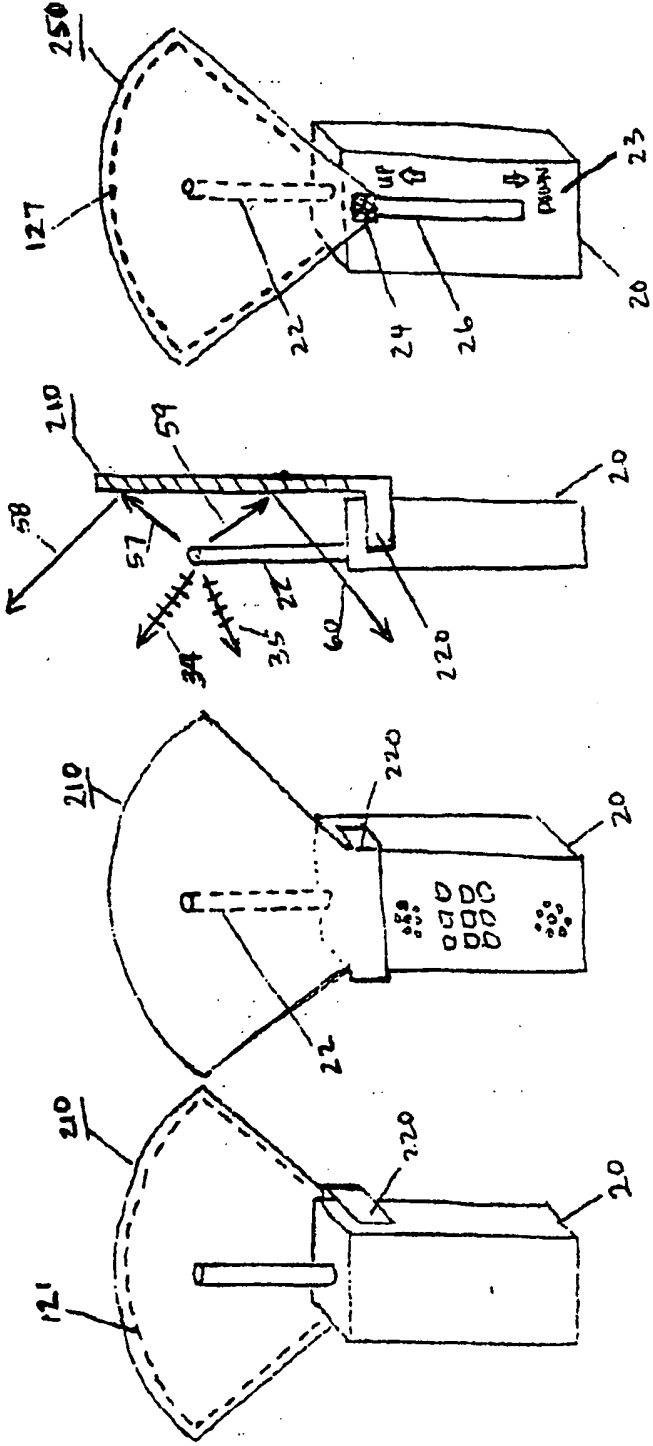


FIGURE 3



INTERNAL POP-UP
FOLDABLE FAN

FIGURE 5

BACK VIEW
PLACEMENT
OF DEVICE

FRONT VIEW

SIDE VIEW

FIGURE 4

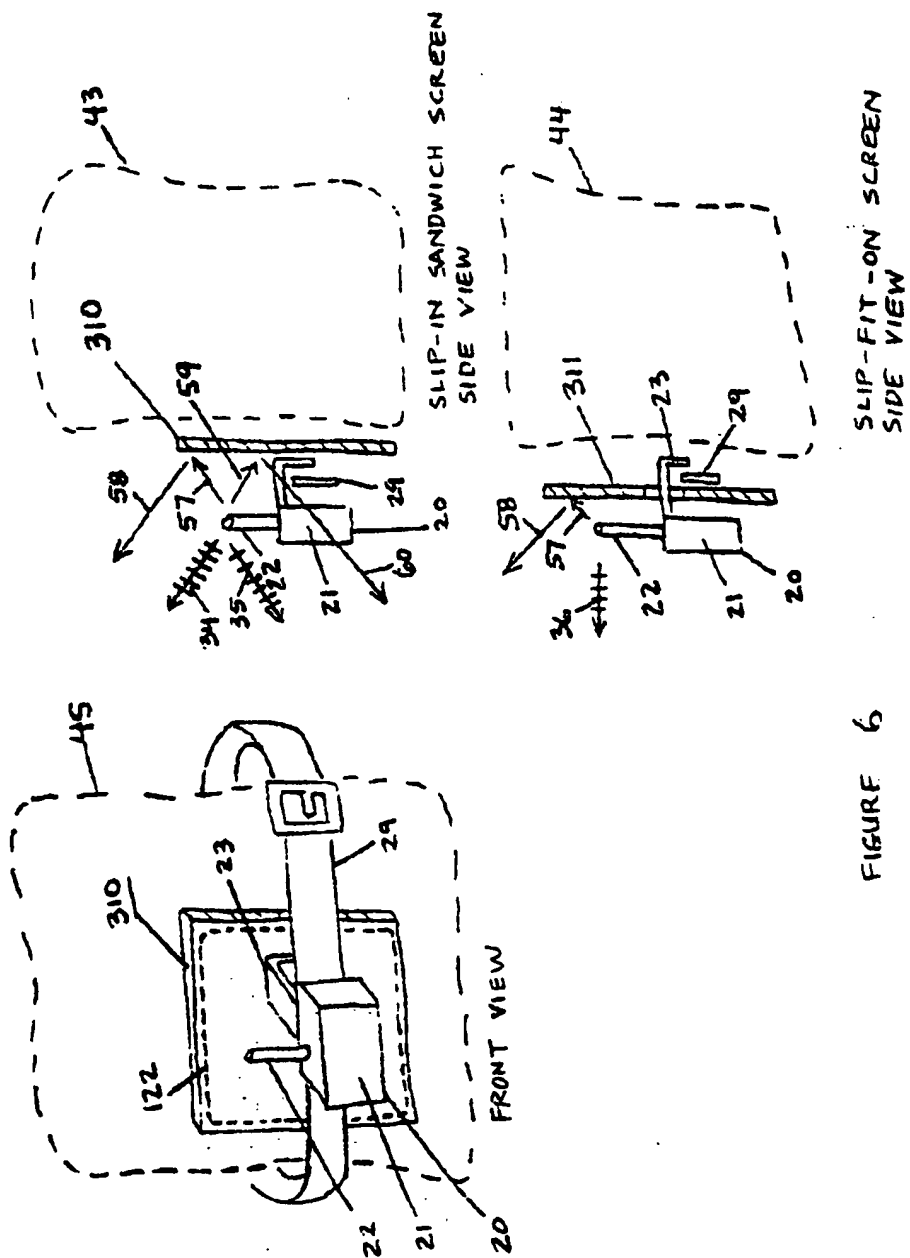


FIGURE 6

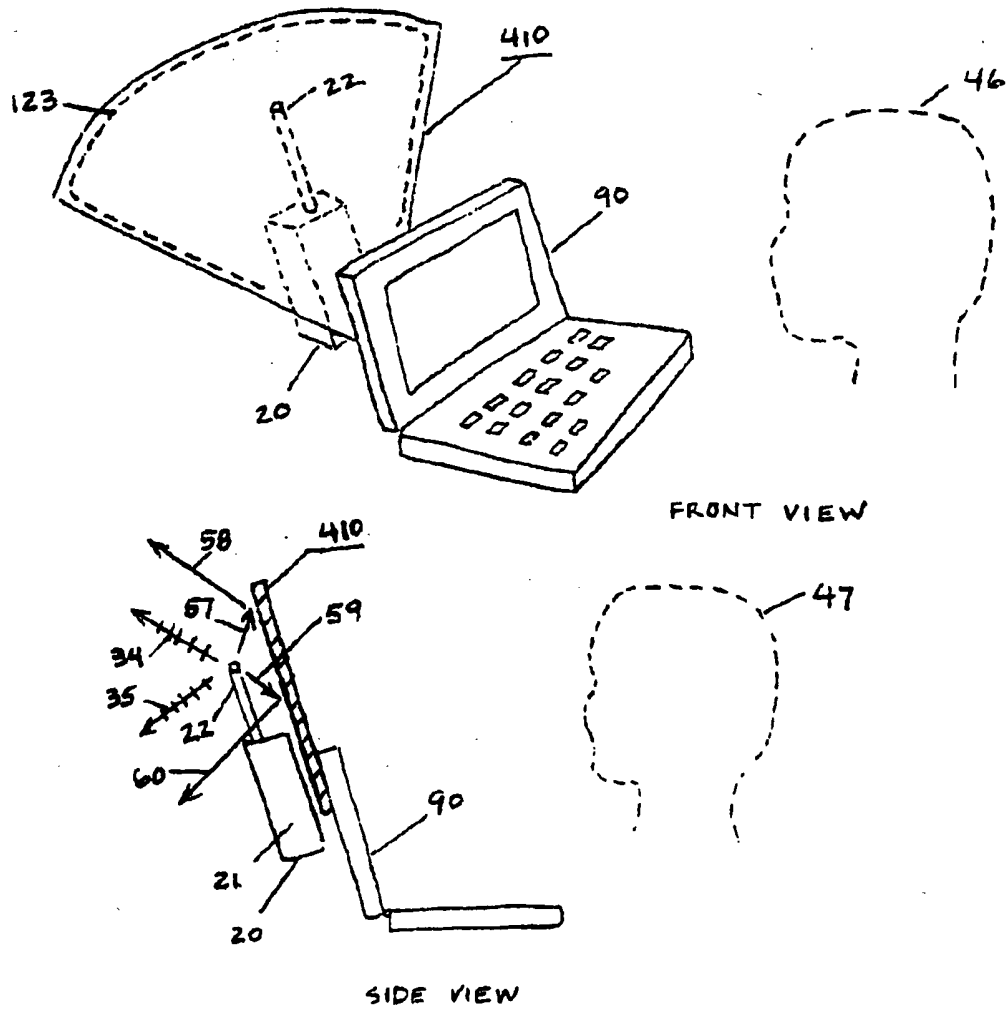


FIGURE 7

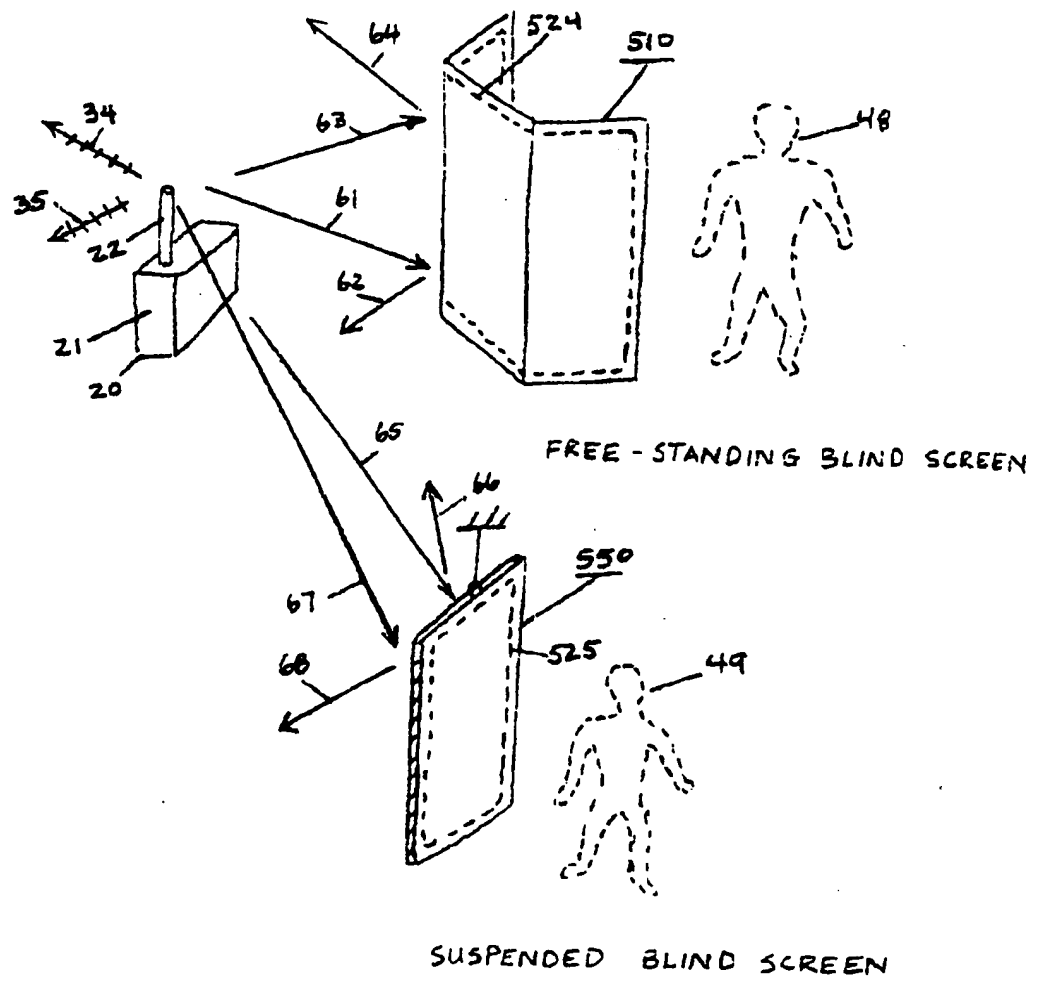


FIGURE 8

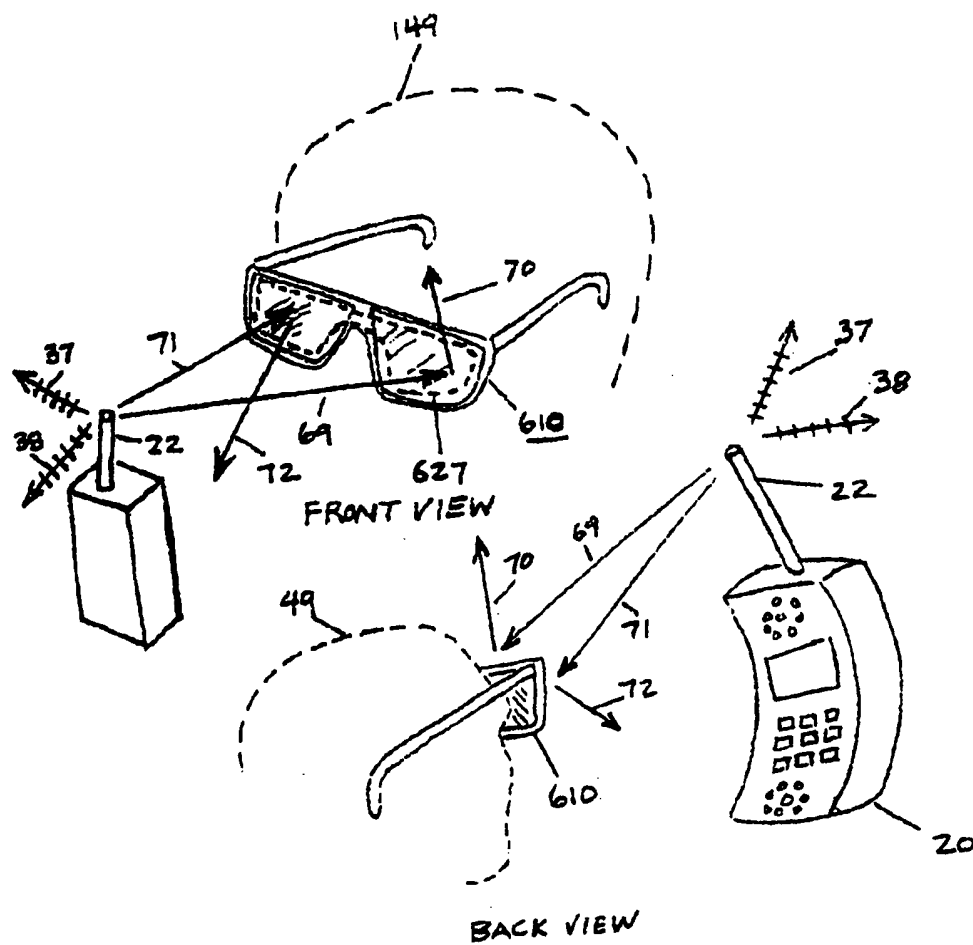


FIGURE 9

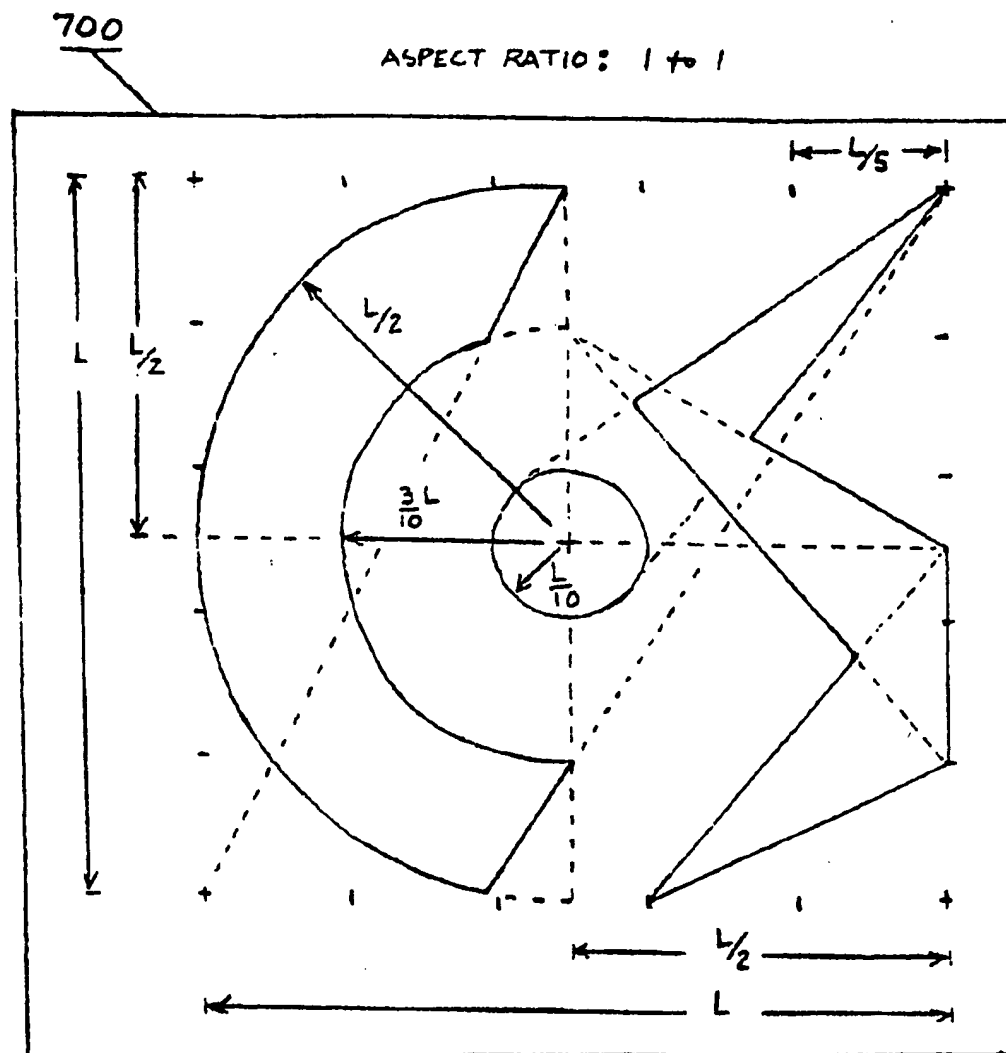


FIGURE 10

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/40315**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(7) :HO4B 1/38

US CL :455/90, 129, 575

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 455/90, 129, 575, 128, 117, 351, 300; 379/437, 451-452, 428, 430, 433, 447, 440; 343/841, 702, 718; 250/515.1; 174/35R; 2/171

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
NONEElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)
NONE**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,570,476 A (OLIVE) 05 NOVEMBER 1996, column 1, lines 40-40, column 2 lines 39-42, figure 1.	1-9

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

21 OCTOBER 2000

Date of mailing of the international search report

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